

## CLAIMS

I/We claim:

- [c1]            1.        An energy-modulating interrogation system for fiber grating sensor, said system comprising:
- a long period fiber grating to sense physical quantities;
  - a broad band light source;
  - a fiber Bragg grating used to achieve a characteristic Bragg wavelength reflection;
  - a coupler between said broad band light source and said fiber Bragg grating to couple the reflected narrow band Bragg wavelength into the said long period fiber grating; and
  - a light intensity measuring assembly to measure light energy passing out through said long period fiber grating.
- [c2]            2.        The energy-modulating interrogation system for fiber grating sensor according to claim 1, wherein said long period fiber grating is a corrugate external force induced long period fiber grating.
- [c3]            3.        The energy-modulating interrogation system for fiber grating sensors according to claim 1, wherein said light intensity measuring assembly is a photodiode that converts modulated transmitted light energy into voltage signal circuitry proportionate to the physical quantities measured.
- [c4]            4.        The energy-modulating interrogation system for fiber grating sensors according to claim 1, wherein said board band light source is a laser diode.
- [c5]            5.        The energy-modulating interrogation system for fiber grating sensor according to claim 4, further comprising a transducer mechanism to convert the

physical quantities to be measured into deformation or temperature and to apply to said long period fiber grating.

[c6]           6.       The energy-modulating interrogation system for fiber grating sensors according to claim 5, further comprising :

                  a WDM and an EDFA, wherein said WDM introduces a laser waveguide from said laser diode into said EDFA to generate said broad band light source of amplified spontaneous emission.

[c7]           7.       The energy-modulating interrogation system for fiber grating sensors according to claim 6, further comprising an EDFA between said WDM and said coupler.

[c8]           8.       The energy-modulating interrogation system for fiber grating sensor according to claim 7, wherein a characteristic narrow band spectrum is generated by lasing, in which a laser light with 980 nm wavelength emitted from said laser diode through said WDM, into said EDFA to generate amplified spontaneous emission broad band light, and further through said fiber Bragg grating to reflect a narrow band light, said narrow band light through said coupler to said EDFA and a reflect mirror to form a resonance chamber to trigger laser effect.

[c9]           9.       The energy-modulating interrogation system for fiber grating sensors according to claim 1, wherein a portion of light energy not modulating by said long period fiber grating is channeled by said coupler to normalize the modulated light energy, so that the measured result will not be affected by fluctuation in the laser light source energy.

- [c10]            10.    An energy-modulating interrogation system for fiber grating sensor, said system comprising:
- a fiber Bragg grating for sensing physical quantities and for a characteristic Bragg wavelength reflection spectrum corresponding to the said physical quantities measured;
  - a broad band light source;
  - a long period fiber grating used to modulate reflected light by said fiber Bragg grating;
  - a coupler between said broad band light source and said fiber Bragg grating coupling the reflected narrow band Bragg wavelength into said long period fiber grating; and
  - a light energy-measuring assembly to measure light energy reflected from said fiber Bragg grating and through said long period fiber grating.
- [c11]            11.    The energy-modulating interrogation system for fiber grating sensors according to claim 10, wherein said long period fiber grating is a corrugated external force induced long period fiber grating.
- [c12]            12.    The energy-modulating interrogation system for fiber grating sensors according to claim 10, wherein said light energy-measuring assembly is a photodiode that transfers modulated transmitted light energy into voltage signal circuitry proportionate to the light energy throughput.
- [c13]            13.    The energy-modulating interrogation system for fiber grating sensors according to claim 10, wherein said broad band light source is a laser diode.
- [c14]            14.    The energy-modulating interrogation system for fiber grating sensor according to claim 13, further comprising a transducer mechanism to convert the physical quantities to be measured into deformation or temperature and to apply to said long period fiber grating.

- [c15] 15. The energy-modulating interrogation system for fiber grating sensor according to claim 14, further comprising a WDM and an EDFA , wherein said WDM introduces a laser waveguide from said laser diode into said EDFA to generate said broad band light source of amplified spontaneous emission.
- [c16] 16. The energy-modulating interrogation system for fiber grating sensor according to claim 15, further comprising an EDFA between said WDM and said coupler.
- [c17] 17. The energy-modulating interrogation system for fiber grating sensor according to claim 16, wherein a characteristic wavelength narrow band reflection is generated by a laser light with 980 nm wavelength emitted from said laser diode through said WDM, emitted into said EDFA to generate amplified spontaneous emission wide band light, and further through said fiber Bragg grating to reflect a narrow band light, said narrow band light through said coupler to said EDFA and a reflect mirror to form resonance chamber to trigger laser effect.
- [c18] 18. The energy-modulating interrogation system for fiber grating sensor according to claim 10, wherein a portion of light energy not modulated by said long period fiber grating is channeled by said coupler to normalize the modulated light energy, so that measured result will not be affected by fluctuation in the laser light source energy.
- [c19] 19. An energy-modulating interrogation system for fiber grating sensor, comprising:
- a long period fiber grating for sensing physical quantities;
  - a fixed wavelength narrow band light source; and
  - a light energy-measuring assembly to measure light wave energy from said fixed wavelength narrow light source and through said long period fiber grating.

[c20] 20. The energy-modulating interrogation system for fiber grating sensor according to claim 19, wherein said long period fiber grating is a corrugated force induced long period fiber grating.

[c21] 21. The energy-modulating interrogation system for fiber grating sensor according to claim 19, wherein said light wave energy-measure assembly is a photodiode circuitry that converts modulated transmitted light energy into voltage signal proportional to the physical quantities measured.

[c22] 22. The energy-modulating interrogation system for fiber grating sensor according to claim 19, further comprising a laser diode of a fixed wavelength narrow band laser light source.

[c23] 23. The energy-modulating interrogation system for fiber grating sensors according to claim 22, further comprising :  
a WDM and an EDF, wherein said WDM to introduce laser waveguide from said laser diode into an EDFA to generate a broad band light source of amplified spontaneous emission.

[c24] 24. The energy-modulating interrogation system for fiber grating sensor according to claim 23, further comprising a fixed wavelength narrow band laser light source generated by laser effect, in which a laser light with 980 nm wavelength emitted from said laser diode through said WDM, emitted into said EDFA to generate an amplified spontaneous emission broad band light, and further through said fiber Bragg grating to reflect a narrow band light, said narrow band light through said coupler to said EDFA and a reflecting mirror to form resonance chamber to trigger the laser effect.

[c25] 25. The energy-modulating interrogation system for fiber grating sensor according to claim 24, further comprising a fiber Bragg grating used to reflect light

to form a characteristic wavelength narrow band, said narrow band light through said coupler to an EDFA and a reflect mirror to form resonance chamber to trigger laser effect, generating said fixed wavelength narrow band laser light source.

[c26]            26.    The energy-modulating interrogation system for fiber grating sensor according to claim 25, further comprising a transducer mechanism to transfer physical quantities to be measured into deformation or temperature and apply to said long period fiber grating.

[c27]            27.    The energy-modulating interrogation system for fiber grating sensor according to claim 19, wherein a portion of light energy not modulating by said long period fiber grating is channeled by said coupler to normalize the modulation light energy, so that measured result will not be affected by variation in the laser light source energy.